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Carp head-kidney leukocytes display different oxygen radical production patterns after DAMP and PAMP stimulation.

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In order to survive multicellular organisms have to be able to distinguish whether their cells are alive or death, they must detect intruders and infections, eradicate invading microorganisms and repair tissue damage. Mammalian studies have demonstrated that the immune-system capacity to distinguish between self and nonself is achieved through the recognition of pathogen-associated molecular patterns (PAMPs) in case of infection, and damage-associated molecular pattern (DAMPs) as self warning signals. It has been speculated that DAMPs and PAMPs are able to drive the nature of the immune-response leading towards pathogen eradication and/or tissue regeneration. The reactive oxygen species (ROS) have shown to play an important role during pathogen eradication and tissue repair. In fish however, the situation is not so clear, the immune-responses elicited by infection, including oxygen radical production have been relatively well described, although the involvement of the fish immune-system in tissue regeneration is not well characterized. The objective of this study is to test the ability of the fish immune-system to differentiate between PAMPs and DAMPs, and thus react to them by producing different oxygen radical profiles, corresponding to bacterial eradication and tissue regeneration respectively. Carp cultured head-kidney leukocytes were stimulated either with β -glucan (MacroGard[®]), or DAMPs obtained from a carp fibroblast cell culture. The kinetics of oxygen radical production were followed for 210 minutes using chemiluminescence. The pattern of oxygen radical production during β -glucan stimulation showed a fast and strong increase in oxygen radicals, in consistency with a pathogenic situation, where the organism targets the intruder for eradication. On the other hand, stimulation with carp fibroblast cellular components elicited a more gradual, steadier and lenient production of oxygen radicals, compatible with a tissue regeneration situation, where low doses of oxygen radicals modulate cellular proliferation and act as cellular messengers. The ability of carp head-kidney leukocytes of reacting differently to self and non-self warning signals is an important feature that opens possibilities for immune-manipulation of the tissue regeneration process in fish. Furthermore, attention is called to the significance of considering the kinetics of oxygen radical production during immune-related processes such as pathogen eradication and tissue regeneration.